# FEDERAL ADVISORY COMMITTEE ACT CLEAN AIR ACT ADVISORY COMMITTEE

# **CLEAN DIESEL INDEPENDENT REVIEW PANEL**

CHAIR: DANIEL GREENBAUM DESIGNATED FEDERAL OFFICIAL: MARY MANNERS

Summary of the Panel's Meeting on May 23, 2002 Alexandria, Virginia

#### I. OVERVIEW

The Clean Diesel Independent Review Panel (CDIRP) met on May 23, 2002, to review the U.S. Environmental Protection Agency's (EPA or the Agency) 2007 Highway Diesel (HD 2007) Rule <sup>1</sup>, discuss the Panel's charge, decide on a format to use in reviewing technological issues, and establish a preliminary schedule and agenda for the remaining three meetings.

The HD 2007 Rule is a technology-forcing regulation for Nitrogen Oxide ( $NO_x$ ) and Particulate Matter (PM) controls. EPA committed in the final rule to report on the progress of NOx adsorber technology, to ensure that adequate technology will be available by 2007. EPA is currently preparing a report on the status of the technology. The EPA report, which also includes a discussion on refining technology progress, is about 80 pages, and will be available for the Panel's review at least one week before the June 27, 2002 meeting.

The purpose of the Panel is twofold:

- 1. To assess the progress of manufacturers of diesel engines and emission control systems in developing technology to reduce engine exhaust pollutants
- 2. To assess the progress of the fuels industry in developing and demonstrating technologies to effectively lower the sulfur level of highway diesel fuel.

The results will be in the form of a concise, qualitative report. Panel members will contribute sections of the report, and Dan Greenbaum (Health Effects Institute), chairman of the Panel, will be the managing editor.

#### II. ACTION ITEMS

1. Panel's Charge. Daniel Greenbaum presented a list of technical questions (below) for the Panel to discuss. The questions addressed the current status and progress of control technologies for  $NO_X$  and diesel particulates, as well as desulfurization technologies and refiners' plans to produce low sulfur diesel fuel. The questions will serve as the focus of the Panel's final report. The Panel discussed whether fuel distribution issues should be addressed. Dan Greenbaum noted that there might be other implementation-related issues identified by the Panel in the course of its discussion which are not part of the Panel's charge, but could be passed on to EPA to be incorporated into its regular monitoring of, and adjustment for, rule implementation.

<sup>&</sup>lt;sup>1</sup>66 FR 5002, January 18, 2001.

- 2. <u>Technology Review Format</u>. John Wall (Cummins Incorporated) presented a format for reviewing technological issues entitled "Assessment of Feasibility." The format includes three parts—functionality, durability, and cost—and serves as a way to qualitatively identify the status and progress of control technologies. The Panel agreed to focus more on the functionality and durability aspects of the review, and less on the cost. Members of the Panel agreed that cost is an important factor for each manufacturer, and that the Panel should be generally aware of these issues, but they did not feel it is primarily within the scope of the Panel's charge to analyze this aspect.
- 3. <u>Upcoming meetings</u>. The second meeting will be held on June 27-28, 2002 in the Washington, D.C. area. The purpose of the meeting will be to outline initial conclusions about the progress of currently available technologies. The Panel will also review EPA's report and determine whether or not the Agency has adequately covered the issues surrounding technological progress. The engine and control technology manufacturers will make presentations. In the third meeting, which will be held July 30-31, 2002, the Panel will review the results of the June meeting in written format, and will begin reviewing issues surrounding fuel technology and production. The final objective of the Panel will be to identify infeasible technologies and address uncertainties among existing technologies in the September 24-25, 2002 meeting.
- 4. <u>ListServer and web site</u>. Mary Manners (US EPA) will set up a list server for Panel members and other interested parties. She will be the administrator of the list server, and all messages must be routed through her. Ms. Manners will also post necessary information on the Panel's web site, including presentations, meeting summaries, and information on upcoming meetings.<sup>2</sup>

#### III. MEETING SUMMARY

Dan Greenbaum called the meeting to order at approximately 9:00 a.m. Members of the Panel introduced themselves, and Mr. Greenbaum noted that Bob Neufeld (Wyoming Refining) was unable to attend due to a last-minute conflict. Panel members identified the organization they represented, and voiced their general support for the implementation of the 2007 Highway Diesel Rule and for the creation of the Clean Diesel Independent Review Panel.

Dan Greenbaum provided introductory remarks. He reminded the group that the HD 2007 Rule is a technology-forcing regulation. The rule requires EPA to provide progress reports on the development of the technology. The review panel is not an EPA decision maker, rather it advises the Agency. The panel will produce a concise report in four or five months. It is unlikely that the Panel will reach a consensus on all issues; it will therefore need to find ways to present its findings.

#### The 2007 Highway Diesel Rule – An Overview

Chet France (US EPA) gave a presentation on the HD 2007 Rule. He highlighted air quality needs and public health concerns related to diesel emissions, and outlined the new NO<sub>x</sub>, PM, and sulfur standards

<sup>&</sup>lt;sup>2</sup>To subscribe to the list server, send a message to <u>listserver@unixmail.rtpnc.epa.gov</u>
Leave the subject line blank, and type the following in the body of the message: subscribe cdirp email address firstname lastname. The website is part of the CAAAC: <a href="http://epa.gov/air/caaac/clean\_diesel.html">http://epa.gov/air/caaac/clean\_diesel.html</a>

for heavy-duty engines and diesel fuel. The rule requires all heavy-duty engines to reduce PM to 0.01 grams per horsepower hour (g/hp-hr) by 2007. At least 50 percent of all engines must meet the  $NO_X$  standard of 0.20 g/hp-hr by 2007, and all engines must meet the standard by 2010. All diesel fuel must meet a standard of 15 parts per million (ppm) sulfur by 2010, and at least 80 percent of the fuel must meet the standard by September 2006. Flexibility provisions provide emissions credits for early compliance with the standards. Canada has proposed to match the United States' standards, and is planning to finalize its rules this summer.

A discussion was held regarding fuel credits. As part of the rule, an Averaging, Banking, and Trading (ABT) program will be available. Rich Kassel (Natural Resources Defense Council) asked if the ABT process will lead into 100 percent compliance by 2010 for all refiners. The rule states that the ABT program will begin in June 2006 and last through 2009. The rule also provides additional hardship provisions for small refiners, as well as any refiner wishing to apply under a case-by-case basis. A flexibility option is also available for refiners subject to the Geographic Phase-In Area (GPA) provisions.<sup>3</sup> A refinery may generate credits if it chooses to produce more than 80 percent of its fuel as low-sulfur diesel, or if it produces low-sulfur fuel before the 2006 implementation date. These credits may be averaged with other refineries owned by the same refiner, banked for future use, or sold to another refinery. A refinery may also produce less than 80 percent of low-sulfur fuel if it obtains enough credits to offset the level of 500 ppm fuel.

A question was raised regarding the requirement that 50 percent of vehicles meet the 0.2 g/hp-hr  $NO_X$  standard. The 50 percent refers to a fleetwide average, as opposed to individual vehicles. This provides some flexibility for meeting the standard, but still requires manufacturers to implement after-treatment technology. The standard requires some interim progress by 2007, but allows for  $NO_X$  adsorber technology to improve until the 2010 deadline. However, there is no requirement for an engine manufacturer to meet the 0.2 standard until 2010 if it uses fleetwide averaging.

Panel members addressed problems associated with distributing clean diesel fuel, since both high (500 ppm) and low (15 ppm) sulfur highway diesel fuel will be available to truckers before 2010. First, retailers may have to install separate diesel pumps for the different fuels. Fuels will also have to be stored in different tanks. Second, Panel members are concerned that truckers will actively seek out high sulfur fuel because it will be cheaper. In addition, clean diesel produced before the 2010 deadline may be contaminated by high sulfur diesel due to mixing in the pipeline, since not all refineries will produce clean diesel by September 2006. Chet France commented that high sulfur diesel will be more difficult to obtain, so the cleaner fuel will ultimately be cheaper. A suggestion was made to examine these problems as part of the Panel's charge. However, since refiners do not have to meet the standard immediately, the Panel does not need to investigate all of these issues at this time. The goal of the Panel should instead be to determine if refineries and terminals will be able to meet the standard in four years.

A question was raised whether a vehicle with emission controls would incur fuel penalties if high sulfur diesel fuel was used. Low sulfur diesel fuel is integral in achieving the low PM and  $NO_X$  standards, and fuel with higher sulfur concentrations will decrease the efficiency of the PM and  $NO_X$  controls in

<sup>&</sup>lt;sup>3</sup>The GPA provision allows refiners in Alaska, Colorado, Idaho, Montana, New Mexico, North Dakota, Utah, and Wyoming to stagger their gasoline and diesel investments. See 65 FR 6698, February 10, 2000.

vehicles. There are also warranty issues with engine manufacturers. The rule states that the high sulfur diesel fuel may only be used in pre-2007 model year heavy-duty vehicles. Chet France commented that the rule does not hold the retailer liable if the end-user chooses to use high sulfur fuel illegally.

## Remarks by Jeffrey Holmstead

Jeffrey Holmstead, EPA Assistant Administrator for Air and Radiation, spoke briefly in support of the new heavy-duty diesel standards. Fine particles are the most serious public health issue with regard to air pollution. Governor Whitman and the White House reviewed this rule very carefully and chose to go forward with it. The two major source sectors of particulate emissions are on-road and non-road diesel emissions, and power plant emissions. The EPA has determined to find the most cost-effective way to bring all States into attainment of the PM<sub>2.5</sub> NAAQS (National Ambient Air Quality Standards), and the diesel standards will play an integral role in achieving this attainment. Because the diesel program is a technology-forcing rule, Mr. Holmstead challenged the Panel to determine what technological progress has been made on the sides of both manufacturers and users.

#### **Review Panel Charge and Questions To Be Considered**

Daniel Greenbaum presented the following list of technical questions for the Panel to discuss:

- 1. What is the current status of the  $NO_X$  adsorber technology to meet the provisions of the HD2007 regulations given diesel fuel with a sulfur cap of 15 ppm? Is industry making progress to develop  $NO_X$  adsorbers in a timely manner? Are the necessary resources and plans being put in place to ensure that the technology is available in 2007? What other technologies are being pursued/developed to enable or facilitate the application of  $NO_X$  adsorbers?
- 2. What is the current status of catalyzed diesel particulate filters to meet the provisions of the HD2007 regulations given diesel fuel with a sulfur cap of 15 ppm? Is industry making progress to develop the catalyzed diesel particulate filter in a timely manner? Are the necessary resources and plans being put in place to ensure that the technology is available in 2007?
- 3. Which refiners have announced their plans for producing low sulfur diesel fuel by June 2006? Where are refiners in their decision making/planning process for complying with the low sulfur diesel program requirements? Are the necessary resources and plans being put in place to ensure that refiners are on track for meeting the 15 ppm sulfur diesel standard in 2006?
- 4. What is the current status of new or improved desulfurization technologies?

## Charges One and Two

The first two sets of questions focus on PM and  $NO_X$  control technology. Overall, the members agreed that these questions are appropriate.

Bob Sawyer (University of California at Berkeley) raised a question about whether the Panel should examine other technologies, like Selective Catalytic Reduction (SCR), or Homogeneous Charge Compression Injection (HCCI). Dan Greenbaum replied that the final rule was based on  $NO_x$  adsorber technology, but other technologies could also be feasible. The rule is a performance-based standard, and does not preclude SCR. However, there are serious issues with the urea infrastructure in SCR technology, and EPA does not see it as a viable technology at this time.

Panel members discussed integration between control technologies and engine modifications. Because control technologies are not passive devices, they require integration with engine design. Tim Johnson (Corning, Inc.) stated that engine information was needed in order to determine the efficiency of control technologies. Rich Kassel pointed out that the last question in Charge One addressed this issue. John Wall suggested focusing on engine modifications separate from Question 1, as these design questions would apply to all technologies.

A question was raised about whether different sulfur concentrations would affect the efficiency of  $NO_X$  adsorbers; i.e., if adsorbers operate differently if the sulfur level is three ppm or 10 ppm. Since the rule has capped sulfur levels at 15 ppm, several Panel members commented, and Dan Greenbaum agreed, that the Panel would not analyze other sulfur level scenarios.

#### Charges Three and Four

The last two sets of questions focus on low sulfur fuel production and new desulfurization technologies. Overall, the members agreed that these questions are appropriate.

Mike Leister (Marathon Ashland) raised a concern regarding separating fuel batches based on sulfur content. Refiners are uncertain if the current technologies to separate fuel batches will be adequate for the new low sulfur standard. Currently, batch sensors are gravity-based, and companies have debated whether this method is compatible with detecting sulfur concentrations.

Tom Bond (BP) questioned the relevance of Charge Four, since the Panel is focusing primarily on existing technologies. He stated that while new technologies emerge constantly, the fuel desulfurization technology to successfully implement the fuel component of the rule already exists. The charge may not be as relevant as it is interesting. Margo Oge (US EPA) concurred, but commented that although the rule was based on existing technologies, EPA is also interested in new technologies, and how those technologies will impact the cost of producing cleaner fuel, especially for future nonroad diesel programs. While the Panel is not focusing on nonroad diesel, EPA has noticed that new technologies emerge as rules are implemented, and is interested in technologies that may impact both highway and nonroad diesel.

Regarding Charge Four, Bill Gouse (American Trucking Association) asked whether other enabling technologies or chemicals should be considered, such as diagnostic controls inside vehicle engines.

The issue of protecting classified information on new technologies was discussed. The Panel may not have sufficient information to review new technologies without revealing classified business information (CBI), especially since all meetings are open to the public. One suggestion was made to comment on the general direction of technologies without divulging private information. The Panel could compare technological progress with another technology-forcing rule, and determine if technology

for the diesel rule is being developed quickly enough. Tim Johnson stated that there is already enough publicly available information to assess whether technology is progressing adequately. One suggestion was made to use industry associations to coordinate presentations by individual companies to provide information on new technologies. However, it was understood that individual companies would be unlikely to divulge confidential information on cutting-edge technology to associations. The Panel agreed not to address CBI in their discussions, and instead invite individual companies to present information on developing technologies.

## Fuel Supply

A discussion was held about adding fuel supply issues to the Panel's charge. Margo Oge noted that EPA has committed to monitoring fuel supply and distribution, and has asked the Panel to focus specifically on the technology questions the Agency has provided. For this reason, energy supply experts are not represented in the Panel. However, several panel members felt strongly about including fuel supply as part of the Panel's charge. Sally Allen (Gary-Williams Energy Corporation) commented that Senator Inhofe requested that fuel supply be addressed by this Panel. Bill Becker (STAPPA/ALAPCO) commented that fuel supply questions should not be discussed. Supply was adequately addressed in the rulemaking, and the rule was upheld by the Court. He feels the Panel should focus only on the issues at hand, and fuel supply issues should be discussed through another venue.

## **Public Comments and Suggestions**

John Medley (ExxonMobil) agreed with the Panel that they should not debate about fuel supply, but urged them to hear the concerns refineries may have about supply. Along with this comment, Mary Manners and Mr. Medley encouraged the panel to distinguish between technical and procedural issues with regard to fuel supply, and focus only on relevant technical issues.

Michael Osborne (NAVSEA) commented that vehicles may need on-board desulfurization technology if the sulfur concentrations are too high in the diesel fuel.

Peter Lidiak (American Petroleum Institute) stated that API supports the clean diesel rule, and is pleased with the Panel. API is concerned about fuel supply and distribution, and would like to hear about other venues for addressing supply issues.

Beth Law (American Trucking Association) stated that ATA is not opposed to the rule, but is concerned that the rule will have a deleterious effect on trucking. Because the price of diesel fuel will likely rise as a result of this rule, the trucking industry may be negatively affected. The Panel lacks representation from the trucking industry. She proposed that an ATA representative be added to the Panel.

Greg Scott (lawyer) represents convenience store and truck stop owners, and petroleum marketers. He would like to include market issues in the Panel's charge. He asked if another forum existed to discuss issues such as retail liability, testing tolerance, supply and distribution issues, and market investment decisions. Mr. Scott also perceives a reluctance to address some real technical issues.

Panel members discussed whether many of the implementation issues could be addressed without reopening the rule. Chet France said the rule could include technical amendments that would not reopen

the rule per se, but this Panel is not an appropriate venue to discuss these issues. Dan Greenbaum stated that technology issues were the primary focus of the Panel, and members should not plan to re-debate issues that had been extensively discussed in the rulemaking. However, he noted that there are always issues that surface after a rule is promulgated that might well arise in the Panel's discussions. The Panel will take note of these issues and pass them onto EPA for inclusion in their regular monitoring of, and adjustment for (e.g., through technical amendments and guidance) those issues.

Frank O'Donnell (Clean Air Trust) is hesitant about opening Panel membership, as it would encourage other, non-technical issues to be addressed that may be outside the charge of the Panel.

Emily Figdor (US PIRGs) was disappointed in not having more representation from environmental organizations. She also urged the Panel to stay narrowly focused on technical issues.

## **Upcoming Meetings**

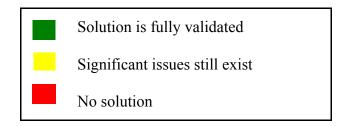
The Panel discussed the format of the next meetings, including presentations from industry members and other issues to be addressed. A preliminary schedule for the meetings was included in the packet. All meetings will occur in the Washington, D.C. area. The second meeting is scheduled for June 27-28, the third meeting is scheduled for July 30-31, and the fourth and final meeting is scheduled for September 24-25, 2002. The meetings will last two days each.

At the June 27-28 meeting, the Panel will review the EPA report, which should be distributed at least one week before the meeting. Dan Greenbaum noted that Panel members might present review comments. The Panel would also like individual companies that are developing NO<sub>x</sub> adsorbers and related technologies to present information on that technology. Bruce Bertelsen (Manufacturers of Emission Controls Association) expressed interest in presenting and discussing the overlap between emission control and engine manufacturers.

The Panel debated how to structure the discussion of upcoming meetings. One suggestion was made to focus on engine issues at the June meeting and fuel issues at the July meeting. Another member suggested that the Panel focus on  $NO_x$  for the June meeting and PM for the July meeting, since it is difficult to separate engine and fuel issues. Panel members commented that engine, fuel, and after-treatment issues would all be integrated. In the EPA report, technical challenges were identified by discussing  $NO_x$  and PM separately, then integrating the discussion at the end. Dan Greenbaum summarized that the next meeting would focus on the engine/vehicle side of the issues (both PM and  $NO_x$ ) and that the following meeting would address the fuel side of the issues. He will work with EPA to determine how the structure of the report will aid in the development of the agendas for the remaining meetings.

John Wall (Cummins) presented an overhead entitled "Assessment of Feasibility" as a way of structuring discussions on technological progress. The handout included the following aspects:

- 1. Functionality
  - Emissions
  - Performance
  - Reliability
- 2. Durability
  - Useful Life
- 3. Cost
  - First cost
  - Fuel economy
  - Maintenance
  - Installation Impact
  - Infrastructure



The boxes in the right corner represent a way to qualitatively rate technology challenges. A technology is "green" if it is fully validated, "yellow" if problems still exist, and "red" if no solutions exist at all. The chart provides a broad overview of issues, and the issues could then be broken down into finer detail if needed. The chart also serves as a starting point in looking at overall progress of a technology, i.e., whether a technology has moved from "red" to "yellow" to "green" at an acceptable pace over the years. A request was made for the Panel to develop a timeline for technology progress. This timeline could be used to determine when technology investments should be dropped if they are not progressing quickly enough.

One comment was made that assigning colors may be too quantitative. Tim Johnson stated that the Panel should examine a spectrum of progress as opposed to snapshots. The Panel should extrapolate progress from a line instead of from discrete points.

The cost section of the chart was discussed at length. Cost is an important factor that should be considered when reviewing technological progress, but it may not be within the scope of the Panel to analyze cost. However, the final goal is to have a technology that is user-friendly, achieves low emissions, and is cost-effective. One comment was made that the chart may be a way to get around quantitatively analyzing cost. The chart would also protect a company's CBI, since EPA would not be required to produce hard data if a technology is assigned a color. Paul Billings (American Lung Association) requested that the Panel not discuss cost at all, since it dealt with CBI to an extent. Industry representatives noted that it was not possible to assess technological feasibility without some consideration of whether the costs of buying and operating the technology would inhibit its use in the market. Margo Oge stated that the EPA report does not address cost, and it is more focused on technical issues and fuel economy impacts. Dan Greenbaum summarized that the Panel would focus first on the functionality and durability sections in the review, since those topics can be analyzed more qualitatively than cost, while having some general awareness of the cost issues.

## **Attendees (Members & Alternates)**

Name Organization

Daniel Greenbaum, Chair Health Effects Institute

Mary Manners, Designated Federal Official U.S. Environmental Protection Agency Sally Allen Gary-Williams Energy Corporation

Bill Becker STAPPA/ALAPCO

Bruce Bertelsen Manufacturers of Emission Controls Association

Paul Billings American Lung Association

Tom Bond BI

Tom CacketteState of California Air Resources BoardPat CharbonneauInternational Truck & Engine CorporationJosephine CooperAlliance of Automobile Manufacturers

Timothy Johnson Corning, Inc.

Rich Kassel Natural Resources Defense Council

James Kennedy UOP LLC

Michael Leister Marathon Ashland Petroleum LLC Bob Sawyer University of California at Berkeley

John Wall Cummins Incorporated

Mike Walsh consultant

Alan Wright Pilot Travel Centers, LLC

## Attendees - Guest Speakers

Name Organization

Jeffrey Holmstead U.S. Environmental Protection Agency

#### Attendees - Technical Consultants to the Panel

Name Organization

Chet France U.S. Environmental Protection Agency

Tom Gross U.S. Department of Energy

Margo Oge U.S. Environmental Protection Agency

#### Attendees - Other

Name Organization

Rebecca Battye EC/R, Inc. – EPA Contractor Support Kathy Boyer EC/R, Inc. – EPA Contractor Support

#### Attendees - Observers

NameOrganizationRobert BabinGeneral Motors

Mitch Baer U.S. Department of Energy

Tom Byers Williams

Charlie Dreuna National Petrochemical & Refiners Association

James Eberhardt U.S. Department of Energy

Roger Fairchild Consultant Susan Field Toyota

Emily Figdor State Public Interest Research Groups
Bill Gouse American Trucking Association

Leo Grassitto ICE

Regina Gray Department of Defense / DESC

Marion Herz U.S. Environmental Protection Agency

Tim Hogan National Petrochemical & Refiners Association

Glen Kedzie American Trucking Association
Beth Law American Trucking Association
Peter Lidiak American Petroleum Institute

Jason Lynn National Association of Truck Stop Operators

Jed Mandal Engine Manufacturers Association

Mark McBride Capital Environmental

Marc Meteyer American Petroleum Institute

Donna Michalet
John Medley
ExxonMobil
Reg Modlin
Daimler Chrysler
Jennifer Molen
Lafane Montague
Frank O'Donnell
Senator Inhofe
ExxonMobil
Daimler Chrysler
AgSource, Inc.
Hogent Hartson
Clean Air Trust

Michael Osborne Naval Sea Systems Command (NAVSEA)

Jeff Reamy Phillips Petroleum

Jerry Russell Ford

Greg Scott Collier Shannon Stephen Sinkez DKA, Inc.

Bob Sussann Lathem & Watkins

Laura Tague Petroleum Marketers Association of America

Brian Whalen International Truck & Engine

June WhelanNational Petrochemical & Refiners AssociationKevin WilliamsDistribution and LTL Carriers Association